

Claims:

1. A double-stranded RNA (ds-RNA) expression vector that comprises the following sequences (a) to (c):

(a) the following nucleotide sequence (a-1) or (a-2):

(a-1) a nucleotide sequence encoding all or a part of the target gene; or

(a-2) a nucleotide sequence encoding DNA that hybridizes under stringent conditions to DNA consisting of a sequence complementary to the nucleotide sequence (a-1);

(b) a nucleotide sequence complementary to the nucleotide sequence (a) and an inverted repeat thereof; and

(c) a sequence encoding a loop region and connecting the nucleotide sequence (a) to the nucleotide sequence (b),

wherein the sequences are transcribed into RNA and thereby forming ds-RNA having a stem-loop structure.

2. The ds-RNA expression vector according to claim 1, which further comprises a polymerase II promoter.

3. The ds-RNA expression vector according to claim 1, which further comprises a developmental-stage-specific promoter.

4. The ds-RNA expression vector according to claim 2 or 3, wherein the polymerase II promoter or developmental-stage-specific promoter is a cytomegalovirus (CMV) early gene promoter.

5. The ds-RNA expression vector according to any one of claims 1 to 4, which further comprises a sequence that autocatalytically cleaves RNA located upstream of the nucleotide sequences (a) to (c).

6. The ds-RNA expression vector according to claim 5, wherein the sequence

that autocatalytically cleaves RNA is a ribozyme site.

7. The ds-RNA expression vector according to any one of claims 1 to 5, which further comprises a sequence that pauses RNA polymerase located downstream of the nucleotide sequences (a) to (c).

8. The ds-RNA expression vector according to claim 7, wherein the sequence that pauses RNA polymerase is a sequence of the MAZ domain.

9. The ds-RNA expression vector according to any one of claims 1 to 8, wherein the nucleotide sequence (c) is as shown in SEQ ID NO: 2, 5, or 6.

10. The ds-RNA expression vector according to any one of claims 1 to 9, wherein the target gene is a disease-associated gene.

11. The ds-RNA expression vector according to any one of claims 1 to 9, wherein the target gene is the Ski gene.

12. The ds-RNA expression vector according to claim 11, wherein a part of the target gene is a 540 bp 5'-region of the Ski gene.

13. A target gene-knockdown animal, in which a ds-RNA for the target gene is expressed.

14. The animal according to claim 13, in which the ds-RNA for the target gene is tissue-specifically expressed.

15. The animal according to claim 13 or 14, which is a transgenic animal having a ds-RNA expression vector introduced therein and expressing ds-RNA for the target gene, or progeny thereof.

16. The animal according to claim 15, wherein the ds-RNA expression vector is any one of those according to claims 1 to 12.

17. The animal according to any one of claims 13 to 16, wherein the target gene is a disease-associated gene, and the animal is an animal model for disease.

18. The animal according to claim 17, wherein the target gene is the Ski gene, and the disease is selected from the group consisting of neural tube closure defect, malformation of the iris, and hemorrhage in the head.

19. The animal according to any one of claims 13 to 18, wherein the animal is a mouse.

20. A method for producing a target gene-knockdown animal, wherein a ds-RNA expression vector capable of expressing ds-RNA for the target gene is introduced to form ds-RNA for the target gene.

21. The method according to claim 20, wherein the ds-RNA expression vector is any one of those according to claims 1 to 12.

22. The method according to claim 20 or 21, wherein the target gene is a disease-associated gene, and the animal is an animal model for disease.

23. The method according to claim 22, wherein the target gene is the Ski gene, and the disease is selected from the group consisting of neural tube closure defect, malformation of the iris, and hemorrhage in the head.

24. The method according to any one of claims 20 to 23, wherein the animal is a mouse.

25. An animal cell having the ds-RNA expression vectors according to any one of claims 1 to 12 introduced therein.